

# Modeling Relevant Legal Information for Consumer Disputes

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**Abstract.** Accessing relevant legal information found in text excerpts from heterogeneous sources is essential to the decision making process in consumer disputes. The Ontology of Relevant Legal Information in Consumer Disputes (ric) is the domain-independent ontology modeling this relevant legal information comprising rights, their requisites, exceptions, constraints, enforcement procedures, legal sources. Its use is exemplified with one extension thereof, the Air Transport Passenger Incidents Ontology (ric-atpi), representing both the possible incidents triggered by a complaint in the air transport passenger domain and the related legal information that might be applicable. The Ontology models the key provisions found in the hard law, and those in soft law, comprising heterogeneous sources in a structured manner. An ontology-based system provides the knowledge embedded in the legal sources and their relation to the specific scenario.

**Keywords.** relevance, legal knowledge modeling, access to legal information

## 1. Introduction

Consumers and citizens should be given with new tools and affordances for self-government, self-monitoring, and market and political participation. Relevance is a fundamental concept in information systems. The general meaning of ‘relevance’ is precisely bound to a context in relation to which a problem is addressed. According to [2]"(...) *an assumption is relevant in a context if and only if it has some contextual effect in that context*", and that assumption "*connects in a context to yield a contextual implication and further contextual effects: for example, strengthening or weakening various assumptions on the hearer, thus ensuring the relevance of the reply in a wider context (...)*". In the legal domain, relevance assumes a particular materiality. The ability to have a formal conceptual model of the multifaceted aspects of the legal sources compounding legal knowledge is a key factor for the development and deployment of applications that benefit from the real usage of the legal-document knowledge in favor of citizens, public administrations, and businesses. Hereby we contextualize relevance within our case study of consumer disputes and enable its representation through an ontology-based system backing a web application providing

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legal relevant information in consumer disputes, in particular, the air transport passenger domain (ATP). A culture of disputing is noticeable in this area, a sector triggering the top ranking complaint EU-wide, as sustained in [4], in detriment of one of the most important consumer rights (ECC-Net Air Passenger Rights Report 2015) The low “claim rate” is explained by two factors: i) the low awareness of passengers about their rights, and the perceived failure of airlines to fully inform passengers of their entitlements, and the accrued lack of compliance; ii) inadequate airline complaint handling procedures discourage many passengers from pursuing a claim (Commission working document SWD (2013)62). This scenario motivates our ontology of legal relevant information in consumer disputes, whilst providing a reference model for decision-makers. Ontologies, as a formal representation of domain knowledge, may fundamentally affect the way in which systems/applications are constructed and shall interoperate via specific shared domain knowledge. RIC-ATPI ontology allows to identify and correlate different incidents and ultimately enabling a better decision-making from the disputants in a specific context, depending on a whole range of incident parameters. A passenger may better identify if the incident to which he has been subjected to is legally motivated and if he is eligible for redress. The air carrier also can better manage incident prevention/containment and complaint thereof. In this paper we outline how work carried out in the past [4][5] is revisited within the relevance perspective applied as a knowledge engineering requirement.

It is asserted that lack of framed information is a root-cause of disputes [6] and we assume that enabling the modeling and disclosure of legal relevant information enhances the decision-making of disputants, which justifies the following research questions: what is legal relevant information in the ATP domain? How could this information be represented through an ontology based-system? How could citizens be empowered regarding their consumer rights?

The remainder of the paper is structured as follows. Section 2 presents the state of the art. Section 3 provides the ontological artifacts and its engineering process. Section 4 describes the evaluation of both the ontologies and the ontology-based system. The paper ends with set-up ideas for future research.

## **2. Related Work**

This paper proposes an ontology-based system to access relevant legal information. This knowledge engineering (KE) approach can be confronted with traditional information retrieval (IR) approaches, including those using NLP techniques. This section briefly describes the state of the art for these approaches, with special emphasis in the consumer law domain and with a short overview of commercial solutions.

If we consider that relevant legal information can determine the success in court, it is no surprise that as early as computers had a minimal processing power in the sixties they were used to aid obtaining legal information [17]. The early systems implemented a Boolean model of IR which is still in use nowadays: both the user query and the documents are regarded as a set of terms; the system simply returns documents including the terms in the query. The recall of this approach is modest [19]. The limitations of this simple strategy lie in dealing with ambiguity, synonymia and complex expressions [26]; and the biggest hurdle is that Law is about ideas and these ideas may not be directly related to a single word. These difficulties were soon

alleviated by taking advantage of the structure of documents (permitting queries per field, where each field has a meaning) or simple linguistic approximation dealing with the problems of homonyms/synonyms appeared [31].

An alternative is representing legal documents in a vector space model and ranking them with similarity metrics [32]. With these IR techniques, documents can be high ranked if they are relevant even if they lack some of the words in the query.

The selection of features to compose the vector representing a document started being only the keywords (as in the FLEXICON system [33]) but nowadays is made up of all the words in the document (or in general n-grams), possibly after having made *part of speech* tagging and being weighted via inference network analysis [34]. These systems yield much better results both in terms of precision and recall [27].

The latest efforts towards populating the feature vector with more discriminated elements have been in the area of topic models [35] [36], which are a type of statistical models for discovering the latent topics that occur in a collection of documents.

As an alternative to IR techniques, ontology-based knowledge engineering techniques have been used to improve the retrieval of the most relevant documents, reporting better results [11]. However, the cost of manually developing ontologies is high and not many ontologies have been specifically used to drive information systems.

With the purpose of facilitating knowledge representation, consumer ontologies have been designed, such as the Customer Complaint Ontology (CCO) and the Consumer Protection Ontology. CCO [12] has been developed in the EU CCFORM project with the aim of studying the foundation of a central European customer complaint form and to underpin an online complaint platform. A customer complaint ontology has been developed and lexicalized in 11 European languages capturing the main concepts in the “customer complaint management” domain. CCO is modularized into seven ontological commitment modules: Complaint, Complainant, Recipient, Address, Complaint Problems, Complaint Resolutions and Contract. The final axiomatization consisted of about 220 concepts and 300 lexicons. The CC glossary is the most useful and reusable component in the CC ontology. The Consumer Protection Ontology, developed within the DALOS project [13]-[15], aimed at providing legal drafters and decision makers with linguistic and knowledge management tools to support the legislative drafting process. The aim is to keep control over the legal language, especially in a multilingual environment, enhancing the quality of the legislative production and the accessibility and alignment of legislation at EU level. The “Consumer protection” domain has been chosen with a normative corpus, on which the bottom-up resources implementation is based. The domain ontology is populated by the conceptual entities which characterize the consumer protection domain, such as CommercialTransaction, Consumer, Supplier, Good and Price. The Consumer Protection Ontology is formalized in RDF/OWL.

Also within the KE paradigm, the cognitive computing paradigm proposed by IBM, deals with uncertainty in a probabilistic manner using reasoned arguments, has started to be applied in the legal domain in different industrial scenarios, like the RossIntelligence system or the IBM partnership with Thomson Reuters<sup>2</sup>.

Within the ATP realm, fee-charging claim websites incorporate a B2C consumer-related business model dedicated to getting passengers compensation from flight companies when their flights are delayed, denied or cancelled. The procedure of

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<sup>2</sup><http://thomsonreuters.com/en/press-releases/2015/october/thomson-reuters-ibm-collaborate-to-deliver-watson-cognitive-computing-technology.html>

operation of these companies follows: a) calculation of the potential compensation that a passenger might be entitled to in case of cancellation, denied boarding or long flight delay, based solely on article 7 of the Regulation from the compensation calculator (software module based on an automatic logic); b) manual evaluation of the chances of a successful claim collection. If the prospects are promising, thereby they bring the claim forward against the airline, tracking its status; c) It follows that when every airline do not respond to the demand for payment or declines to pay, they recommends each user to engage the commissioned lawyers with no further costs, or the passenger has to claim in court (or Small Claims Court). Key-players of this market are: Sky Mediator, Claims4flights.com, AirHelp, Flightright, Resolver, Refund.me, FairPlane, EUclaim, EUDelay, Flight-Delayed.co.uk. Overall, these existing companies do not manage baggage nor service incidents which unleashes disputes and legitimate grounds of redress. The contextualized information regarding the procedures to claim and involved institutional entities are out of the spectrum of the provision of these services, information which we assume a priori welfare-enhancing self-litigation and empowering of the decision-making process. They do not comprehend overall legal framework, case law, best practices nor links to official sources.

Other information systems provide access to legal documents, as the openlaws.eu platform which grant an alternative access to legal documents found in Eur-Lex with enhanced functionalities (metadata explicitly shown, comments by the community are possible). The European project eucases.eu also harvested case law from Eur-Lex to offer it in a better form. Metadata is offered as RDF and most notably there is a public SPARQL endpoint to make complex queries. These portals are increasingly using better methods to obtain the relevant documents to a particular user query.

### 3. Modeling Relevant Legal Information for Consumer Disputes

Ontology Engineering refers to the set of activities concerning the development process, life cycle, methodologies, tools, etc. [23]. Herein, we use the legacy guiding methodologies: METHONTOLOGY [21][22][24], MeLon (Methodology for legal ontologies) and Neon specification tasks [20] to ensure sustainable modeling.

#### 3.1 Ontology Requirements Specification

The Ontology Requirement Specification Documents (ORSD) [25] described below refers to the activity of collecting the requirements that the ontologies should fulfill: a) purpose, intended scenarios of use, end-users, etc.; b) level of formality; c) scope. Table 1 presents the ORSD for the RIC and RIC-ATPI ontologies.

**Table 1.** Ontology requirements document of RIC and ATPI

<b>RIC-ATPI Ontology Requirements</b>
Purpose. The ontology models ATP incidents and the legal relevant information derived thereof.

<p>Scope. Its scope resides in air transport passenger incidents, within the EU geographical delimitation. Even though ATPI is consumer-based (related to business-to-consumer (B2C) transactions), our approach is broader, as a passenger might be considered a consumer or a professional<sup>3</sup>. Incidents correlate from complaints and disputes against air carriers (retrieved from complaint databases, official surveys, official reports and case law), following a bottom-up approach analysis. Input incidents are heretofore known information about an incident, as the ones that can trigger redress.</p> <p>The degree of detail of the ATP incidents aligns to the conceptualization consigned in the Recommendation of the European Commission on the use of a harmonized methodology for classifying and reporting consumer complaints and enquiries SEC(2010)572, which is a common framework for all European complaint handling bodies. Also ATPI conforms with the typology of incidents consolidated in case-law of the CJEU, in EU Regulations, ECC-Network Reports, legal doctrine and in the EU Commission Communications.</p> <p>Is it out of the scope of the ATPI accidents, death or any other bodily injury suffered by a passenger, incidents related to package tours and contractual problems between online bookings, and the rights for disabled passengers and persons with reduced mobility.</p> <p>We provide in <b>RIC-ATPI Ontology</b> the specific rights and the related relevant legal information derived thereof according to each incident: the concrete exceptions, constraints, further interpretations and enforcement procedures) using the specific content refracted in the legal source, thus, at the level of normative provisions, recitals from legislation, paragraphs from a specific case-law or from the European Commission. RIC-ATPI declares as class <i>AirTransportPassengerIncident</i> that is a subclass of <i>RIC:Incident</i>; it also includes the legal relevant information as class-instances of RIC classes.</p>	
<p>Functional requirements of RIC-ATPI ontology are represented through informal competency questions (CQs) [37]. The answerability of CQs hence becomes a functional requirement. CQs from were extracted from external expert generated content sources, portrayed in Figure 1..The Catalan Consumer Agency (CCA) complaints database served also as a resourceful tool to derive new incidents. The CQ were also discussed with experts in the ATP domain interviewed to validate the ATPI knowledge base. The CQs are: (1) What are the Air Transport Passenger incidents? (2) Given a set of incidents, which are the baggage, service and flight incidents? (3) What are unfair commercial practices<sup>4</sup> and unfair contract terms? (4) For any given incident, which enforcement procedures should be followed? (5) Which is the procedure to enforce the rights in case of baggage incidents? (6) Which are the exceptions in case of a flight cancelation, delay and denied boarding? (7) Which are the constraints in case of a flight cancelation, delay and denied boarding? (8) Which are the passenger's rights in case of a cancelled flight? (9) What are extraordinary circumstances in baggage and flight incidents? (10) When the passengers has no right in the incident of denied boarding? (11) Which are the requisites for the entitlement of rights?</p> <p>The ontology should articulate the types of relevance: topical, cognitive, situational and domain legal relevance.</p>	
<p>For the ontology <i>implementation</i>, OWL 2 language and Protégé for the ontology development environment were used. The online documentation can be consulted online in <a href="http://ricontology.com/ontoricatpi.html">http://ricontology.com/ontoricatpi.html</a></p>	
Intended End-Users	User 1. Air carriers; User 2. Passengers; User 3. Stakeholders (Regulators, National Enforcement Bodies (NEBS), ECC-Networks, Consumer Agencies and Ombudsmen, Alternative Dispute Resolution (ADR) Bodies, Courts, Legal Assistance Consultancies, Private Claims Companies, Enterprise Europe Network, Travel Agencies, Intermediate Booking Platforms or Price Comparison Websites, and collaborative economy.
Intended Uses	Use 1. Legal Decision Support-System; Use 2. Online Dispute Resolution Platform

<b>RIC Ontology Requirements</b>	
Purpose. RIC is an upper ontology, representing the legal relevant information in a domain-neutral area.	
Scope. The scope of RIC is based on the European legal framework (civil law). The Ontology uses a general granularity at the level of legal terms, identifying rights, obligations, prohibitions, exceptions, constraints, enforcement procedures.	

<sup>3</sup>'Passenger' is a larger notation than 'consumer' but it would be beneficial for more effective enforcement, and for the protection of all passengers, to state that all passengers are to be seen as consumers, regardless the reason for their travel.

<sup>4</sup>BEUC position paper on the European Commission's report on the application of the Unfair Commercial Practices Directive, Ref.: X/2013/049, in <http://www.beuc.eu/publication/position-papers>

For the ontology <i>implementation</i> , OWL 2 language and Protégé for the ontology development environment were used. The online documentation can be consulted online in <a href="http://ricontology.com/ontoric.html">http://ricontology.com/ontoric.html</a>	
Intended End-Users	User 1. Dispute Resolution Services, Regulators, ECC-Networks, Consumer Agencies and Ombudsmen, Alternative Dispute Resolution (ADR) Bodies, Courts, Legal Assistance Consultancies, Private Claims Companies
Intended Uses	Use 1. Legal Decision Support-Systems; Use 2. Online Dispute Resolution Platform

### 3.2. Knowledge Acquisition

Following a legal pluralistic perspective of legal sources, we manually harvested domain expert conceptual knowledge from normative frameworks [38]. It fits into a pragmatic approach [55][56]. The user-context of our ontology-based system confines both the elicitation and the knowledge acquisition processes both for RIC-ATPI and RIC ontologies. Therefore, the documentation and/or the kinds of expert-consultant documents are identified as the elicited sources to gather a correspondence and a "semantic deepness"<sup>5</sup> between the use of the terminology in current practice, and an ecologically valid ontology. For eliciting and engineering the legal relevant information, relevance was considered to inform our knowledge base. Within information systems, manifestations [1][7] -[10] of relevance were conceived and are allocated in our framework:

(1) Topical, which consist in the "*relation between the subject or topic expressed in a query and the topic covered by retrieved information objects*". In our case, the topicality relates the ATP incident and the suggested information of the system.

(2) Cognitive or pertinence, which is the "*relation between the cognitive state of knowledge of a user and information objects retrieved*". In our case, the relevant legal information represented by the ontology support system should reflect the user's needs.

(3) Situational, meaning the "*relation between the situation, task, or problem at hand and the retrieved information objects*". In our case, the reciprocal correspondence between the incidents depicted in the system file and vivid incidents reflecting the problem at hand, described in complaints.

(4) Domain or "legal importance"[39], which "*present the most important legal documents within a specific domain*". For case-law it can be defined as "*the importance of a judicial decision for the whole legal community, as distinct from, on the one hand, the influence the decision has on the parties involved, and, on the other hand, the relevance of the case for a particular user of an information system or a specific search query*"[39]. Is two- folded, requesting the most important domain documents, within a specific legal domain. In our case, the ontology support system should present the most the most important legal documents within the ATP domain, as depicted in figure 1.

Given the relevance threshold, we assumed in our knowledge base a broad approach to the law, considering more than explicit legal knowledge. We invoke (i) secondary sources of law: EU Regulations and Directives, (ii) supplementary law: case law, and (iii) soft law instruments<sup>6</sup>, fluidizing the soft law/hard law<sup>7</sup> divide. Accordingly, the captured legal material was carried out through text analysis from pondered sources of

<sup>5</sup> <http://www.estrellaproject.org/doc/D1.4-OWL-Ontology-of-Basic-Legal-Concepts.pdf>

<sup>6</sup> [http://europa.eu/eu-law/decision-making/legal-acts/index\\_en.htm](http://europa.eu/eu-law/decision-making/legal-acts/index_en.htm)

<sup>7</sup> Hard law corresponds to the situation where hard obligation and hard enforcement are connected,[40].

hard, soft law and policies, and we also include *practical legal professional knowledge* "that goes beyond codified legal knowledge in the aforementioned forms and consists in the know-how that tells how to apply codified knowledge in concrete situation" [3], never the less, part of the multilevel structure of legal knowledge (Fig.1).

Soft law are "[r]ules of conduct that are laid down in instruments which have not been attributed legally binding force as such, but nevertheless *may have certain – indirect – legal effects*, and that are aimed at and may produce *practical effects*" [40], which have been used historically to alleviate a lack of formal law-making capacity and/or means of enforcement, European Parliament Resolution (2007/2028(INI)) (emphasis added). Having legal relevance, we assume means that soft law norms: (i) can be used by courts and by decision makers to interpret another rule; they are 'law-like promises or statements' [41], complementing hard law, by giving interpretations or additional information, and exert influence on actors, without resorting to judicial coercion; (ii) may have a practical impact as a hard law norm [40]. It is our assumption that there is a *continuum* line from non-binding legal positions to legally binding [40] ones. In practice, we may derive from soft law instruments legal and practical effects which are considered by the CJEU and national courts, in particular, rights, obligations, constraints, even with soft or no enforcement, echoing from them. Some examples are referred. The CJEU held that national courts are *bound* to account Commission's Recommendations in order to decide disputes submitted to them, whenever they cast light on the interpretation of national measures"<sup>8</sup>. Recitals 14 and 15 of the EC Regulation, considered as soft law, enunciate some events regarded as extraordinary circumstances, which merits the CJEU adjudication as to determine to which extent the air carrier is exempted from paying compensation. The NEB's Draft list of Extraordinary Circumstances<sup>9</sup> is evaluative in national courts. As a constraint to the right of accommodation and transportation, the Information Document of Directorate-General for Energy and Transport<sup>10</sup> posits that it has to be taken in account the practicalities faced by the airline, such as the distance from the airport to the closest available hotels, combined with the time of the replacement flight in the following day. The right to rerouting is further interpreted by the Communication COM(2007)168, whereas stated rerouting alternatives can be proposed by other means of transport, such as train, taxi or bus, if, the distance to be covered is appropriate for such transport modes, a practice followed by the air carriers, and represented in our knowledge base.

In our model, soft law comprises both legally binding and non-legally binding norms. The fact that norms have 'legal relevance' is sufficient to place them on the 'legal' side of the norms continuum, albeit their non-binding character.

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<sup>8</sup> Case C-322/88 *Grimaldi* [1989] ECR 4407, paragraph 18. In Community law, a Recommendation is a legal instrument that enables the Commission to establish non-binding rules for the Member States or, in certain cases, Union citizens. Article 211 of the EC Treaty provides that "[i]n order to ensure the proper functioning and development of the common market, the Commission shall formulate recommendations (...)".

<sup>9</sup><http://ec.europa.eu/transport/themes/passengers/air/doc/neb-extraordinary-circumstances-list.pdf>

<sup>10</sup>[http://ec.europa.eu/transport/themes/passengers/air/doc/neb/questions\\_answers.pdf\\_reg\\_2004\\_261.pdf](http://ec.europa.eu/transport/themes/passengers/air/doc/neb/questions_answers.pdf_reg_2004_261.pdf)

<b>Hard Law</b>	<b>Generally binding</b>	<b>Legislation:</b> Regulation 261/2004/EC, Montreal Convention 1999 ; <b>Case Law; Contractual terms of air carriers</b>
<b>Soft Law with Legal Relevance</b>	<b>Non Binding</b> (evoked by consumer-based organizations)	.EU Commission Communications, Recommendations, Public Consultations, Working Documents .European Consumer Organization position papers (BEUC) .NEB's Draft list of Extraordinary Circumstances .EU complaint form
	<b>Non Binding</b> (evoked by airline industry)	<b>Policies</b> .IATA Glossary, IATA Reports, IATA General Conditions of Carriage (Passenger and Baggage)
	<b>Non Binding</b> (generally evoked)	<b>Reports, Surveys, Statistics, Datasets</b> .Eurocontrol Reports .Eurobarometer Surveys .European Consumer Centers Network (ECC-Net) Reports .European Low Fares Airline Association (ELFAA) statistics .Dataset consumer complaints from Catalan Consumer Agency

**Fig. 1.** Hard and soft law sources in the ATP domain

An advocated property when representing legislation is that its executable representation, within legal knowledge based systems, should be isomorphic to their sources [42]-[45]. This principle evokes a one-to-one correspondence between the concepts in the knowledge base system to the source texts, as a basic principle of system construction in the legal domain [46]. It is thereby argued that keeping the structure of the formalisation as close as possible to the original sources, assures and benefits, among other things, verification, validation and maintenance as the legislation is amended. Complete isomorphism challenges the peculiar structural features of legal texts[47]. AI&Law tools [48] usually are focused on the task of applying a logic formalism to achieve isomorphism (e.g. often using plain text, paraphrase techniques or simplified English text—ACE<sup>11</sup>), relying their attention only on the norm modeling and on the foundational logical theory. Representing legislation, far from a mechanical process, requires interpretation against the context of applicable legal conventions, and the way in which the legislation is applied in practice. In our KB one source unit is formalized in more source unit, and one single KB unit conflates material from several source items (contiguous source units are mixed in one KB). Nonetheless we aim to make visible in the text the “evidence” that there is a minimal, but reasonable interconnection of a textual legal link, within a formal representation. Legal experts and policy-makers are interested in verifying the results of the legal formal representation and its applications and in finding evidence in the legally binding text that more and more, nowadays, is available on the web in digital format.

### 2.3 Ontology Conceptualization

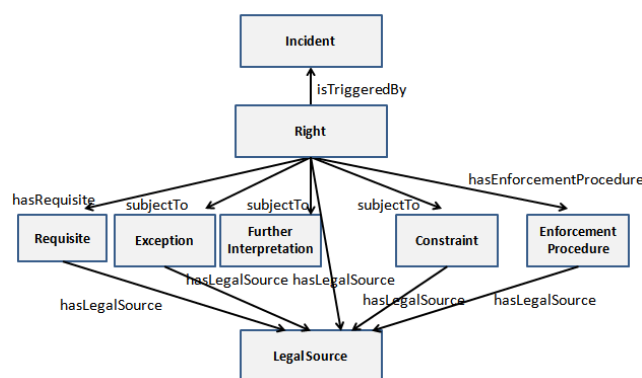
The ontologies' conceptualization activity implied the organization and conversion of the informally perceived sight of our domain into a formal components specification.

**The Relevant Legal Information for Consumer Disputes (RIC) Ontology.** Consists in a framework for representing relevant, legal information in a domain-neutral manner, hence, able for reuse in other domains (telecommunications, banking, utilities, etc). It describes the *Rights* emerged in the legal system whenever an *Incident* occurs.

<sup>11</sup> ACE—Attempto Controlled English: <http://attempto.ifi.uzh.ch/site/>



The bundle of rights [49] are depicted in a *LegalSource*. The entitlement of Rights depend on some Requisite. The scope of the Rights may encompass *RelevantInformation*, such as: *Exception*, *Constraint*, *EnforcementProcedure* and *Further Interpretation*, each of them referring to a specific *LegalSource*, respectively. The component *Exception* means excluding the entitlement of a right conceived by a legal norm. An exception "is something that is excluded from a general statement or does not follow a rule" according to the Ontology of basic Legal concepts<sup>12</sup>. A Constraint comports a limitation to the exercise of a legal right, conveyed by hard or soft law. A *Requisite* concurs with a legal requirement bound to the entitlement of rights. An *EnforcementProcedure* is vested in procedures to enforce the legal rights, such as handling complaint and legal action procedures. Enforcement within consumer policy is defined as "encompassing a spectrum of activities undertaken by a variety of actors, using different instruments, to ensure that consumer rights are respected (...) These include formal enforcement proceedings, primarily undertaken by public enforcement authorities, but also consumers acting to defend their own rights through private enforcement or other dispute-resolution mechanisms. An effective enforcement response combines activities which promote compliance through information of consumers and businesses, with more formal enforcement measures", COM(2009) 330. *LegalSource*, as Sartor defines, is a "any fact that embeds normative propositions and makes them legally valid by virtue of such an embedment" [50]. According to the ontology of basic concepts of law, a legal source is a source for legal statements, both norms and legal expressions. In a sense it is literally a 'source' of law"<sup>13</sup>. *FurtherInterpretation* is conceived as additional relevant information related to the legal right. The class *Right* epitomizes the principal class of RIC ontology. We use the concept used in CLO: "A legal position by which an Agent is entitled to obtain something from another Agent, under specified circumstances, through an enforcement uttered either in a Law, Contract, etc."<sup>14</sup>. Articulating these pieces of information and encoding formally intended meaning from a legal text within an ontological approach is an outcome of an interpretive act. Thus, this may provide results that can be considered only as heuristical means for legal professionals or citizens. Nonetheless, the acquired correlated information derives from authoritative legal sources.



<sup>12</sup> <http://www.estrellaproject.org/doc/D1.4-OWL-Ontology-of-Basic-Legal-Concepts.pdf>, p. 61

<sup>13</sup> Ontology of Basic Legal Concepts, <http://www.estrellaproject.org/doc/D1.4-OWL-Ontology-of-Basic-Legal-Concepts.pdf>

<sup>14</sup> <http://www.loa-cnr.it/ontologies/CLO/CoreLegal.owl>

**Fig. 4.** RIC ontology. Arrows denote object properties, domain and range

**The Air Transport Passenger (ATPI) Ontology.** It expresses the objects in the domain of discourse - the main clustered flight disruptions that frame the ATP dispute market. Is aligned towards the Recommendation of the EU Commission on the use of a harmonised methodology for classifying consumer complaints SEC(2010)572 and we accord the expert knowledge accordingly to this common framework, devising the categorization of the incidents by analyzing the types of complaints. *AirTransportPassengerIncident* is the main class and compounds three types of sub-incident *FlightIncident*, *BaggageIncident* and *ServiceIncident* as described below. The isA relations are represented using two constructors, one in OWL and the other in RDFs. The Ontology is lightweight, where concepts are described in natural language, as ATPI is aimed at legal professionals with no technical knowledge about ontologies and logic. An *AirTransportPassengerIncident* can be subsumed to atomic or composite incidents (combining an interplay of more than one incident detected in the same complaint), which means it is conceivable to ascertain in one dispute a combination of incidents, e.g. a *DelayedFlight* and a *DelayedBaggage*.

*FlightIncident* consist of: (1) *CancelledFlight*, which means the non-operation of a flight which was previously planned and on which at least one place was reserved. (2) *DelayedFlight* occurs when an operating air carrier reasonably expects a flight to be delayed beyond its scheduled time. It includes: (i) "*DelayedFlightAtArrival*", as when an operating air carrier reach their final destination three hours or more after the scheduled arrival time (originally scheduled by the air carrier); (ii) "*ShortDelayAtDeparture*," occurring when an operating air carrier reasonably expects a flight to be delayed beyond its scheduled time of departure, from 2 to 5 hours; (iii) "*LongDelayAtDeparture*", when an operating air carrier reasonably expects a flight to be delayed at least 5 hours; (iv) "*Following day delay at departure*" occurs when the reasonably expected time of departure is at least the day after the time previously announced. (3) "*DeniedBoarding*" means a refusal to carry passengers on a flight, although they have presented themselves for boarding. It includes (i) *VolunteerDeniedBoarding* incident, whereas a passenger has presented for boarding on time and responds positively to the air carrier's call for passengers to surrender the reservation in exchange for benefits. (ii) *CompelledDeniedBoarding* incident, whereas a passenger has presented himself for boarding on time and does not respond positively to the air carrier's call for passengers to surrender his reservation and hence is compelled to yield it. (iii) *DeniedBoardingOnAConnectingFlight* incident, whereas a passenger is denied boarding on a connecting flight due to the fact their previous flight was delayed and caused further delay by the airline. (iv) *DeniedBoardingOnReasonableGrounds* incident, when there are reasonable grounds to deny boarding to passengers, such as reasons of health, safety or security, or inadequate travel documentation. (4) *InsolvencyIncident*, occurring whilst an air carrier has insufficient assets to meet all debts. Passengers may be affected when: i) travelling at the very moment their airline got bankrupt and cannot return home without at least some delay and very possibly extra cost; and ii) tickets were bought in advance, and paid the whole amount, being thus stranded. *ServiceIncidents* are related to the service provided in the carriage contract and comprise the following incidents. *SeatMisplacement* occurs when an operating air carrier misplaces a passenger in a class different than that for which the ticket was purchased, including *Downgrading* and *Upgrading*. *Irresponsiveness*

incident relates to the difficulties suffered by the passengers when they aim to obtain information from the air carrier on where and how to complain and on claim redress (e.g. no phone number, no email or all telephone lines busy, no response to the complaint). *CustomerServiceInsatisfaction* incident declares the insatisfaction with the level or quality of the service provided, for example, with the booking or the ticket management (booking error; discriminatory issues; quality of food or the behavior of some of the employees; long check-in waiting time due to the slow billing process, etc). *Unfair Commercial Practices* incident consist in commercial practices which are dishonest, misleading. *UnfairContractTerms* incident reflects a contractual term causing an imbalance to the consumer, such as the non-transferability of tickets to other passengers; “no-show” clause; non-refundable of tickets in case of force majeure of the passenger, or the application of surcharges for the use of credit cards. *BaggageIncident* is categorized into (i) *DamagedBaggage* incident, as any physical damage to baggage and/or its contents; (ii) *LostBaggage*, as a piece of baggage which is irretrievably lost; (iii) *DelayedBaggage*, as a piece of baggage which fails to arrive at the airport of destination on the same flight as the passenger, but is subsequently delivered; and finally (iv) *DestroyedBaggage* incident, corresponding to a baggage which became unusable.

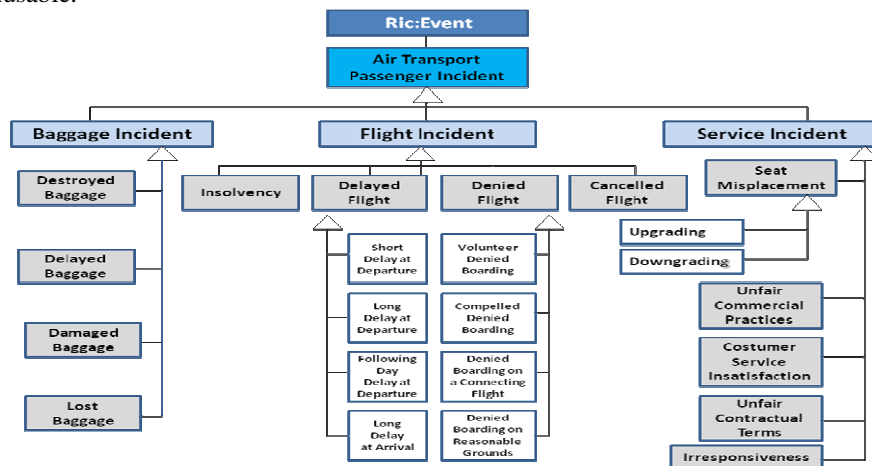
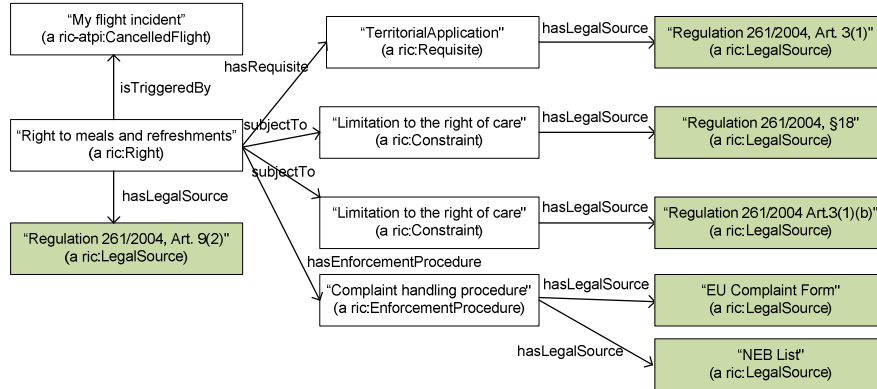


Fig. 3. Class diagram of the ATPI Ontology

**RIC-ATPI.** By conflating RIC and ATPI ontologies, we derive RIC-ATPI, the relevant legal information in the air transport passenger domain. It declares as class *AirTransportPassengerIncident*, which is a subclass of *RIC:Incident*; RIC-ATPI also includes the legal information as class-instances of RIC classes. We illustrate an example of the relevant information regarding the right to meals and refreshments that applies when a flight is cancelled. It includes requisites, constraints and enforcement procedures modeled as class individuals.



**Fig. 5.** RIC-ATPI: boxes denote classes, arrows denote object properties, with the arrow meaning domain and range.

## 4. Evaluation

The proposed ontologies can be used to drive an ontology-based system providing relevant information for each of the previously foreseen cases. This section provides an evaluation of both the ontologies and the system.

**Evaluation of the ontologies.** The following aspects of the ontologies have been evaluated. (i) *Consistency*. RIC and ATPI ontologies are consistent according to the Hermit 1.3 reasoner; complexity being  $\mathcal{ALU\mathcal{H}}$  (attributive logic with concept union and role hierarchy) and  $\mathcal{AL}$  respectively; (ii) *Conformance to good practices*. The OOPS online service [54] was used to verify that the ontologies were rid of critical pitfalls<sup>15</sup> and (iii) *Satisfaction of the requirements*. A total of 15 competency questions had been posed for the RIC and ATPI ontologies. Upon construction of the ontology, these questions were verified as answerable with the elements in the ontology. Further, some of them were made explicit as SPARQL queries<sup>16</sup>.

**Evaluation of the system.** In order to demonstrate the ability of the ontology to serve as a knowledge base of a computer program providing relevant legal information, the demonstrative application available at <http://ricontology.com/application.html> was

<sup>15</sup> At the time of writing of this article, the ontologies had as URI the git URL, but they it is planned to be moved to the <http://ricontology.com> domain.

<sup>16</sup> The SPARQL queries are available online as <http://ricontology.com/cq.html>. For example, the following query determines which are the rights for a short delayed departure.

```
? SELECT (str(?lab) as ?label) (str(?com) as ?comment) (str(?sour) as ?sourcelabel)
(str(?sc) as ?sourcecomment) (?r as ?uri) ?tipo{
  ?r ric:isTriggeredBy ric-atpi:shortdelayedatdeparture .
  ?r rdfs:label ?lab .
  ?r rdf:type ?tipo .
  OPTIONAL {
    ?r rdfs:comment ?com .
  }
  OPTIONAL {
    ?r ric:hasLegalSource ?ls .
    ?ls rdfs:label ?sour .
    OPTIONAL {
      ?ls rdfs:comment ?sc .
    }
  }
}
FILTER (?tipo != owl:NamedIndividual) .
} ORDER BY ?label LIMIT 50
```

developed. This application permits selecting the type of incident and the particular case. Then, the relevant legal information is shown. This information consists of the precise excerpts that are relevant, together with the precise provenance information (e.g. which article in which regulation). Additional information is shown for specific circumstances or interpretations when moving the mouse over the general description. The demonstrative application proves the feasibility of the idea, but in the future an extended evaluation will be made. Equivalent efforts have been extrinsically evaluated in the past, namely, comparing the obtained results with those obtained from other procedures and estimating the precision and recall of the system.

## 5. Conclusions and Future Work

This paper presented an ontology for the representation of legal information in consumer disputes, which can be of interest for both disputants and facilitates the access to the key excerpts of the relevant documents intermediating between the legal publisher and the legal consumer. Accessing to hard law, but also to relevant soft legal sources of information plays a role in the decision-making process of the parties. Soft governance and the use of soft law might be viewed as a new form of soft governance in the *continuum* line of soft law hardening. It can be argued that soft law is helping to reduce the democratic deficit by the emphasis it puts on deliberation and participation of the stakeholders. Relevance is accounted in the legal knowledge modeling as an engineering requirement of the ontology development process, in particular, in the specification, knowledge acquisition, conceptualization and formalization phases.

A web-based application is being construed backing up the present ontology-based system. While the ontology has been evaluated in this paper, no proper evaluation has been given for the ontology-based system. The evaluation of this system necessarily has to be compared in terms of precision, recall and access time with other means of accessing the same information: a Google search, queries in Lexis and Westlaw systems or the intermediating companies. This remains as future work.

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